Registration No :

Total Number of Pages : 03   B.Tech.
                                                                                            PET4I102

4th Semester Regular / Back Examination 2017-18
ELECTRICAL MACHINES & POWER DEVICES
BRANCH : ECE, ETC
Time : 3 Hours
Max Marks : 100
Q.CODE : C776
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1   **Answer the following questions:** *multiple type or dash fill up type:*   **(2 x 10)**

a)   If the pole flux of a dc motor approaches zero, its speed will
(a) approach zero
(b) approach infinity
(c) no change due to corresponding change in back emf
(d) approaches a stable value between zero and infinity

b)   The emf induced in the armature conductors of DC generator is alternating innature. (True / False)

c)   Magnetization curve for a DC generator does not ordinarily start from zero due to _____.

d)   An electric motor in which both the rotor and stator fields rotate with same speed is called ……………. Motor.
(a) DC   (b) universal   (c) synchronous   (d) charge

e)   The power factor of an alternator is determined by its
(a) Speed   (b) load   (c) excitation   (d) prime mover

f)   A 4-pole three-phase induction motor has a synchronous speed of 25 rev/s.The frequency of the supply to the stator is _____.

g)   The field winding of an alternator is _____ excited. (ac / dc/ both ac and dc/not)

h)   The resultant flux developed by stator of a three phase induction motor is ____times the maximum value of flux due to one phase.

i)   If copper losses are 400 W at a load current of 10 A in a transformer, then the copper losses will be _____ at a load current of 5 A.

j)   The direction of rotation of a single phase motor can be reversed by
(a) Reversing connections of both windings
(b) Reversing connections of the starting winding
(c) Using a reversing switch
(d) Reversing supply terminals

Q2   **Answer the following questions:** *Short answer type:*   **(2 x 10)**

a)   What will happen if the primary of a transformer is connected to a DC supply?

b)   Why is a DC series motor used to start heavy loads?

c)   Draw the phasor diagram of a lossless transformer at no load.

d)   What are the advantages of having stationary armature with rotating field systemover a rotating armature with stationary field system?

e) What will happen if a shunt motor running at no-load has its shunt winding open accidentally?

f) Why starting current of Induction motor is higher than the transformer?

g) Between DC shunt and separately excited generators, whose terminal voltage is high? Justify.

h) Give any two applications of Brushless DC motors.

i) The rotor resistance per phase and standstill rotor reactance per phase of a 3-phase IM is 0.2 ohm and 1 ohm respectively. What should be the value of external resistance per phase to be inserted in the rotor circuit to give maximum torque at starting?

j) A 50 Hz, 4 pole , 3 phase induction motor has a rotor current of frequency 2 Hz.Determine (i) the slip and (ii) speed of the motor

Part – B (Answer any four questions)

Q3 **a)** A 4 pole lap connected armature of a dc shunt generator is required to supply the following loads in parallel: (i) 5kW Geyser at 250V (ii) 2.5kW Lighting load at 250V. The generator has a resistance of 0.2 ohm and field resistance of 250 ohms. The armature has 120 conductors in the slots and runs at 1000 rpm. Allowing 1V per brush foe contact drop and neglecting friction, find (i) Flux per pole (ii) Armature current per parallel path (iii) total copper loss. **(10)**

b) With neat diagram explain voltage build up of a shunt generator. **(5)**

Q4 **a)** A 240 V DC shunt motor runs at 800 rpm and takes armature current of 2 A. Find the resistance required in series with the shunt winding so that the motor may run at 950 rpm when taking an armature current of 28 A. Assume flux is proportional to field current. The shunt field resistance is 160 ohm and armature resistance is 0.4 ohm. **(10)**
Give two disadvantages of this method of speed control. What other methods can be used to control speed of a DC shunt motor? Explain briefly with diagram.

b) Compare DC shunt motor and DC series motor on the basis of Speed ~Armature Current characteristic, Torque ~Armature Current characteristic, Speed ~Torque Characteristic and their applications. **(5)**

Q5 **a)** A 4 pole, 32 conductors, lap-wound dc shunt generator with terminal voltage of 200volts delivering 12 amps to the load has armature resistance 2 ohm and field resistance of 200ohms. It is driven at 1000rpm. Calculate the flux per pole in the machine. If the machine has to be run as a motor with the same terminal voltage and drawing 5A from the mains, find the speed of the motor. **(10)**

b) Explain briefly how a single phase induction motor is different from three phase induction motor? **(5)**

Q6 **a)** A 1-phase, 250/500V, 50 Hz transformer gave the following results: **(10)**
O.C. test: 250 V, 1 A, 80W……… on L.V. side
S.C. test: 20 V, 12 A, 100 W ……….. on H.V. side
Calculate
(i) magnetizing current and the component corresponding to core loss at normalfrequency
(ii) the equivalent circuit constants
(iii) Draw the equivalent circuit diagram as referred to H.V. side.
(iv) Voltage regulation and efficiency at half load and 0.8 pf leading.

b) What are different losses in a transformer? Explain the detailed procedure to determine efficiency of the transformer with neat circuit diagram. **(5)**

Q7 **a)** The effective resistance of a 1200 kVA, 3.3kV, 50Hz, 3 phase, Y connected **(10)**
alternator is 0.5 ohm between any two terminals. A field current of 35A
produces a current of 200A on short circuit and 1.1kV (line to line) on open
circuit. Calculate the power angle and voltage regulation when the machine is
delivering full load at 0.8 pf lagging. Draw the corresponding phasor diagram.

b) Discuss different methods of starting of synchronous motor. **(5)**

Q8 **a)** Explain the principle of three phase induction motor. Explain the Torque slip **(10)**
characteristics and derive the condition for maximum torque of a three phase
induction motor.

b) Using phasor diagram, derive the expression for power and torque of **(5)**
synchronous motor.

Q9 **Write notes on any THREE :** **(5 x 3)**
a) Double field revolving theory
b) Speed control of DC series motor
c) BLDC motor drive circuits
d) Starting methods of three phase induction motor